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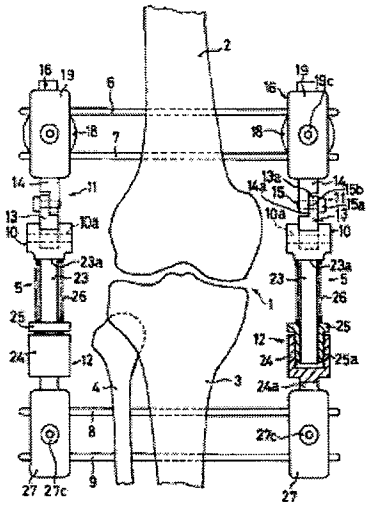
(54) [Title of the invention] External artificial joint

(57) [Abstract]

[Purpose] To provide an artificial joint 5 which allows the joint free extension and flexion and which does not impose any load on the joint.

[Structure] Support members 11 and 12 are linked to both sides of the hinge 10 and the support member 11 has rods 13 and 14 and an angle adjusting section 15 and is connected to clamper 16. The supporting member 12 is structured such that the rod 23 is inserted through a tubular part 24 in which an adjustment ring 25 is screwed and a spring 26, which receives a force in the expansion direction, is connected to a clamper 16. The clampers 16 and 27 are linked to the external parts of the through-pins 6 to 9, which pass through the femur 2 and tibia 3, so that the body weight is transferred from the femur 2 to the tibia 3 via the spring 26 of the artificial joint 5, without imposing any load, and reducing impact, on the knee 1. When the knee joint is extended or flexed, the artificial joint 5 extends and flexes around hinge 10, and thus does not obstruct the movement of the knee.

Comment [GV1]: There is a mistake in the original stating 26.



[Claims]

[Claim 1] An external artificial joint characterised in that clampers that support pins which are linked to the bones are connected to the ends of a pair of supporting members linked by a hinge.

[Claim 2] An external artificial joint, according to Claim 1, characterised in that a shock absorber is fitted to at least one of the said supporting members.

[Detailed Description of the Invention]

[0001]

[Area of industrial use] The present invention relates to a device that reduces the load imposed on a joint, used in the treatment of joint diseases in humans or animals.

[0002]

[Prior art] Means of reducing the loads imposed on joints have included means of limiting the load *ad hoc* by the use of sticks or crutches and means of rendering the joint immobile by the use of an external support. In the means in which a support is used, the load on the joint is reduced but since the movement of the joint is limited, it is impossible to carry out normal everyday activities, which is inconvenient.

[0003]

[Problems the invention aims to solve] The present invention has the purpose of proposing a device which reduces the load imposed on a joint without reducing its movement.

[0004]

[Means by which the problems are solved] The first means by which the problems are solved, as described in Claim 1, is characterised in that clampers supporting pins which are linked to the bones are connected to the ends of a pair of supporting members linked by a hinge.

[0005] The second means by which the problems are solved is as described in Claim 1 Claim 1, and is also characterised in that a shock absorber is fitted to at least one of the said supporting members.

[0006]

[Actions] When the device according to Claim 1 is used, the device is fitted so that traction is applied to the joint, which both prevents a load being imposed on the joint and also allows the joint to move by the use of a hinge. In the means according to Claim 2, impacts transmitted to the skeleton via the artificial joint are damped by the shock absorber.

[0007]

[Examples] Below the invention is described in greater detail with reference to the figures. In Figures 1 and 2, 1 is a human artificial knee joint, 2 is a femur, 3 is a tibia, and 4 is a fibula. 5 is the artificial joint according to the invention, which is attached to through-pins 6~9 on both sides of the leg. The said through-pins 6~9 are the same as those used with external ring fixators for bone fractures.

[0008] The artificial joint 5 is furnished with support members 11 and 12 which are linked so as to be freely rotatable by a hinge 10 with a spindle 10a. The support member 11 comprises rods 13 and 14, and both rods 13 and 14 are linked by angle adjustment part 15 so their angles are freely adjustable. The said angle adjustment part 15 is superposed on protruding parts 13a and 14a of the rods 13 and 14 and joined to them by fixing screw 15a. A chrysanthemum-shaped metal fixture 15b is formed on each of the contact surfaces of the protruding parts 13a and 14a and these engage to prevent slippage.

[0009] The end side parts of the rod 14 is fixed to the clamper 16 so as to be freely adjustable. The clamper 16, which is of the same type as those used to fix external ring fixators for bone fractures to the pins that penetrate the bone, comprises a rod clamper 17, rotating plate 18 and pin clamper 19.

[0010] The rod clamper 17, which has a hole that fits the rod 14 and a slit 17a which extends to the said hole, is fixed to a location on the rod 14 by fixing the said slit 17a by tightening a fixing screw 17b. The rotating plate 18, which has an arcuate surface 18a at its outer end and a slit (not shown) and fixing screw 18b, fits onto the protruding part 17c extending from the rod clamper 19 so as to be freely rotatable and is fixed by being adjusted in the direction shown by the arrow 20. The pin clamper 19 has clamping plates 19a and 19b which support pins 6 and 7 and fixing screw 19c and the said clamping plate 19a is superposed on the said arcuate part 18a. A fixing screw 19c is screwed into a female thread and supported so as to be able swing freely inside the rotating plate 18 and when the pin clamper 19 is adjusted in the direction shown by the arrow 21 over the arcuate surface 18a and the fixing screw 19c is tightened, the pin- clamper 19 is fixed to the rotating plate 18, with through pins 6 and 7 supported.

[0011] The other support member 12 has a rod 23 and a tubular part 24, which the said rod 23 passes through, and a step part 23a is fitted to the rod 23. The thread part 25a of the adjustment ring 25 is formed in the said tubular part 24 and a spring 26 is fitted between the step part 23a and the adjustment ring 25 to provide damping.

[0012] The clamper 27 is linked to the connecting part 24a, which extends downward for the tubular part 24 and both ends of the through-pins 8 and 9 are supported by the said clamper 27. The said clamper 27 comprises clamping plates 27a and 27b and fixing screw 27.

[0013] With the structure described above, the clamper 27 is fixed to the through-pins at the bottom, the fixing screw 18b of the rotating plate 18 of the top clamper 16 is tightened, the rod 14 and through-pins 6 and 7 are restrained by the rod clamper 17 and pin clamper 19, and the fixing position and fixing angle of the fixing screws 17b, 18b and 19c are adjusted as they are tightened; thus traction is applied to the joint and the hinge is fixed so as not to obstruct the joint's movement.

[0014] When this is done, the angles of the rods 13 and 14 are adjusted by angle adjustment part 15 and the shape of the support member 11 adjusted, the adjustment ring 25 is rotated to adjust the repulsive force of the spring 26 adjusted and also to make fine adjustments to the vertical position of the hinge 10.

[0015] When the device is fitted in this way, the greater part of the body weight is transmitted from the femur via through-pins 6 and 7, the artificial joint 5 and the through pins 8 and 9 to the tibia 3, so that the body weight has a minimal effect on the joint. Also, when the knee joint is extended or flexed, the artificial joint 5 also extends or flexes around the hinge 10, making it possible to walk and engage in other everyday activities.

[0016] In the above embodiment, the artificial joint is used on both sides of the leg but it may also be used in a one-sided form in which the through-pins 6~9 protrude from only one side of the leg and a single artificial joint 5 is fitted. Also, in the said embodiment, the bottom clamper 27 and tubular part 24 are joined in the connection part 24a but it is also possible to fit a freely adjustable position adjustment mechanism in place of the said connecting part 24a. and also possible to fit clampers 16 or 27 vertically, in which case the clamper's shape is the same vertically.

[0017] The structure of the hinge 10 need not be that shown in the figures. It is also possible to give some extra place to the hole that receives the spindle 10a by, for example, making it larger or oval or an arc shape like a simplified heart shape.

[0018] The above description has concerned the use of the joint when used with a knee joint but it may also be used for an elbow joint and also be used for pets and farm animals.

[0019] As described above, since, in the invention according to Claim 1, a pair of supports, capable of flexing and extending around a hinge, is fixed externally along the joint, it has the effects of making it possible to reduce the load applied to the joint, which is useful in therapy, and to allow the joint to flex and extend freely, preventing any hindrance to activity.

[0020] The invention according to Claim 2 has the effect of reducing discomfort by damping the impacts transmitted through the artificial joint by the use of a shock absorber.

[Simple Description of the Figures]

[Figure 1] A plan view of an embodiment of the invention in use.

[Figure 2] A side view of the above.

[Legend]

5 Artificial joint	6~9 Through-pin
10 Hinge	
11, 12 Support members	13, 14, 23 Rods
15 Angle adjustment part	
16, 27 Clampers	17b, 18b, 19c, 27c Fixing screws
24 Tubular part	25 Adjustment ring
26 Spring	

Figure 1

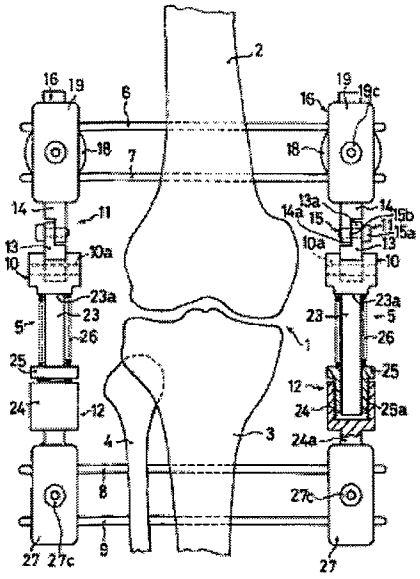


Figure 2